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Rev. 07/10/02

intervals, especially those with anemia, growth failure, and developmental or behavioral problems. Treatment protocols are well worked out, but chelation is only part of the therapy. Controlling the environment, strengthening the family's supports, enhancing nutrition, and offering remedial education are essential to a successful therapeutic outcome. Lead control has involved a continuing struggle between vested economic interests and regulatory agencies. In one area, the control of airbone lead, science, and public health have prevailed. In the past decade, the amount of alkyl lead consumed in gasoline additives has been reduced by 99%. Body lead burdens have dropped in close correspondence.(ABSTRACT TRUNCATED AT 400 WORDS) (110 Refs.)

6/7/9
06715393 89017393
The neurotoxic, teratogenic, and behavioral teratogenic effects of lead at low dose: a paradigm for transplacental toxicants.
Needleman HL
School of Medicine, University of Pittsburgh, PA 15213.
Prog Clin Biol Res (UNITED STATES) 1988, 281 p279-87, ISSN 0361-7742 Journal Code: PZS
Languages: ENGLISH
Document Type: Review
(22 Refs.)

6/7/10
06651375 88296375
Recent developments: UAW vs Johnson control.
Needleman HL; Bellinger D
University of Pittsburgh School of Medicine.
Environ Res (UNITED STATES) Aug 1988, 46 (2) p190-1, ISSN 0013-9351 Journal Code: EI2
Languages: ENGLISH

6/7/11
06573672 88218672
The surface morphology of normal and atherosclerotic coronary arteries in Macaca fascicularis and the effect of coronary angiography.
Bellinger DA; Lewis JC; Clarkson TB
Division of Laboratory Animal Medicine, University of North Carolina, Chapel Hill 27514.
Scanning Microsc (UNITED STATES) Mar 1988, 2 (1) p449-64, ISSN 0891-7035 Journal Code: UEC
Contract/Grant No.: HL-14164; T32-RR-7009
Languages: ENGLISH
Selective coronary angiography is one of the procedures used frequently in the diagnosis and management of coronary artery disease. Macaca fascicularis monkeys were used to study the effects of coronary angiography on coronary artery surface morphology. Fourteen M. fascicularis were fed either an atherogenic diet (0.34 mg of cholesterol/kcal and 40 to 43% of the calories as fat) for six to nine months or a control diet. For six of these animals the Judkin method of selective left coronary angiography was done 24 h prior to necropsy. The ascending aorta, right coronary artery, left circumflex (LCX), left anterior descending (LAD) and left main (LM) coronary arteries were examined using scanning electron microscopy (SEM). The animals fed an atherogenic diet had 27% of the ascending aorta and 7% of the coronary arteries covered with raised lesions. The surface of these coronary arteries differed from those of animals fed a control diet in that the surface appeared smoother and often had numerous adherent leukocytes. The animals undergoing coronary angiography had 25% of the ascending aorta and 10% of the LM surface injured by the catheter. These areas were denuded

of endothelium and covered with adherent platelets. There were no morphologic changes observed by SEM following angiography within the LCX or LAD arteries. Thus even in a setting of hypercholesterolemia exposure to contrast media during the coronary angiography procedure did not lead to surface alterations.

6/7/12
06437552 88082552
Biomarkers in neurodevelopmental toxicology.
Needleman HL
Department of Psychiatry, Children's Hospital of Pittsburgh, PA 15213.
Environ Health Perspect Oct 1987, 74 p149-52, ISSN 0091-6765
Journal Code: EIO
Languages: ENGLISH

6/7/13
06386888 88031888
Lead exposure and children's IQ [letter]
Needleman HL
Int J Epidemiol Sep 1987, 16 (3) p485, ISSN 0300-5771
Journal Code: GR6
Languages: ENGLISH

6/7/14
06377939 88022939
Newborns classified by umbilical blood lead concentration [letter]
Needleman HL
Arch Environ Health Jul-Aug 1987, 42 (4) p242-5, ISSN 0003-9896
Journal Code: 6YO
Languages: ENGLISH

6/7/15
06369727 88014727
Low level lead exposure in the fetus and young child.
Needleman HL
Children's Hospital of Pittsburgh, PA 15213-3417.
Neurotoxicology Fall 1987, 8 (3) p389-93, ISSN 0161-813X
Journal Code: OAP
Languages: ENGLISH
Document Type: Review
(17 Refs.)

6/7/16
06361371 88006371
Pregnancy hypertension, blood pressure during labor, and blood lead levels.
Rabinowitz M; Bellinger D; Leviton A; Needleman H; Schoenbaum S
Mental Retardation Research Center, Children's Hospital and Harvard Medical School, Boston, MA.
Hypertension Oct 1987, 10 (4) p447-51, ISSN 0194-911X
Journal Code: GK7
Contract/Grant No.: HD-08945; HD-17407; HD-20381; +
Languages: ENGLISH
Pregnancy hypertension, blood pressure during labor, and the umbilical cord blood lead concentration were assessed in 3851 women for whom additional demographic, medical, and personal information was available. Lead levels correlated with both systolic (Pearson r = 0.081, p = 0.0001) and diastolic (r = 0.051, p = 0.002) blood pressures during labor. The incidence of pregnancy hypertension increased with lead level. Multivariate models of pregnancy hypertension and systolic blood pressure as a function

Needleman HL
Neurotoxicology Summer 1986, 7 (2) p497-514, ISSN 0161-813X
Journal Code: OAP
Languages: ENGLISH
Document Type: Review
(40 Refs.)

6/7/21
05979061 86280061
Lead levels--comment [letter]
Needleman HL
J Learn Disabil Jun-Jul 1986, 19 (6) p322-3, ISSN 0022-2194
Journal Code: IWO
Languages: ENGLISH

6/7/22
05931363 86232363
Correlates of low-level lead exposure in urban children at 2 years of age.
Bellinger D; Leviton A; Rabinowitz M; Needleman H; Waternaux C
Pediatrics Jun 1986, 77 (6) p826-33, ISSN 0031-4005 Journal Code:
Contract/Grant No.: 8945; 17407
Languages: ENGLISH
The blood lead levels of a large number of US preschool children approach the value regarded as the upper limit of normal. To reduce the number of children whose levels increase into the range thought to be toxic, the antecedents and correlates of levels in the 0- to 25-micrograms/dL range must be identified. In a large longitudinal study of middle and upper-middle class children living in metropolitan Boston, we evaluated how well five sets of variables predicted children's blood lead levels at 2 years of age: environmental lead sources, mouthing activity, home environment/care giving, prior developmental status, and sociodemographic characteristics. A series of bivariate and multivariate analyses indicated that only environmental lead sources and, to a lesser extent, mouthing activity accounted for significant portions of the variance in blood lead levels. Environmental lead sources were not significantly related to the home environment/care-giving variables or to sociodemographic characteristics. The most promising approach for achieving community-wide reductions in children's blood lead levels is reduction in the amount of lead in the proximate environment.

6/7/23
05930240 86231240
Low-level lead exposure and infant development in the first year.
Bellinger D; Leviton A; Needleman HL; Waternaux C; Rabinowitz M
Neurobehav Toxicol Teratol Mar-Apr 1986, 8 (2) p151-61, ISSN 0275-1380 Journal Code: NXX
Contract/Grant No.: HD08945; HD17407
Languages: ENGLISH
The developmental impact of prenatal and early postnatal low-level lead exposure was assessed in a prospective study of 249 middle and upper-middle class infants with umbilical cord blood lead levels in the range currently considered "normal." Infants were classified into three exposure groups: "low" (less than 3 micrograms/dl), "mid" (6 to 7 micrograms/dl), and "high" (greater than or equal to 10 micrograms/dl). At 6 and 12 months, the lead concentration of capillary blood was measured, and the Bayley Scales of Infant Development administered. At both ages, Mental Development Index scores, adjusted for confounding, were inversely related to infants' umbilical cord blood lead levels. The difference between the mean adjusted

scores of the infants in the low and high cord blood lead groups was 5.8 points at 6 months and 7.3 points at 12 months. At neither age were scores significantly related to postnatal blood lead levels. Prenatal exposure to lead levels relatively common among urban populations appear to be associated with less favorable development through the first year of life.

6/7/24
05863208 86164208
Occurrence of elevated protoporphyrin levels in relation to lead burden in infants.
Rabinowitz MB; Leviton A; Needleman HL
Environ Res Apr 1986, 39 (2) p253-7, ISSN 0013-9351 Journal Code: EI2
Contract/Grant No.: HD-08945
Languages: ENGLISH
Simultaneous blood lead (PbB), erythrocyte protoporphyrin (EP), and hematocrit measurements were made semiannually in 232 normal infants from 6 to 24 months of age. The PbB averaged 7 (SD = 5) and ranged from 0 to 64 micrograms/dl. The incidence of elevated EP, a marker for deranged heme synthesis, was unrelated to PbB at levels below 15 micrograms/dl but was fourfold greater among the infants with PbB above 15 micrograms/dl. This relationship persisted even after eliminating the 31 (4%) anemic (hematocrit less than 33%) samples. The confounding effects of iron deficiency are discussed.

6/7/25
05780648 86081648
Environmental correlates of infant blood lead levels in Boston.
Rabinowitz M; Leviton A; Needleman H; Bellinger D; Waternaux C
Environ Res Oct 1985, 38 (1) p96-107, ISSN 0013-9351 Journal Code: EI2
Contract/Grant No.: HD-08945
Languages: ENGLISH
From a blood lead survey of 11,837 births, 249 newborns were enrolled in a 2-year, longitudinal study. Their blood leads (PbB) were measured semiannually, and their homes were visited for repeated collections of dust, soil, indoor air, tap water, and paint. Recent refinishing activity and the sizes of nearby streets were recorded. Overall mean PbB was 7.2 micrograms/dl (SD = 5.3) at birth. PbB did not vary systematically with age. Each subject's average postnatal PbB correlated highly with the amount of lead in dust (r = 0.4, P less than 0.0001) and soil (r = 0.3, P less than 0.001), and with the lead in paint (r = 0.2, P less than 0.01). Dust, soil and air lead levels correlated with one another. Refinishing activity in the presence of lead paint was associated with elevations of PbB. Water lead, proximate traffic, weight of recovered dust, race, maternal age and education, and sex were not predictive of PbB. Multivariate models of PbB were constructed that become increasingly predictive with age (r2 = 20 to 37%). Indoor dust lead, lead in soil, refinishing activity, and season were the independent variables.

6/7/26
05780632 86081632
Methodological issues in modeling the relationship between low-level lead exposure and infant development: examples from the Boston Lead Study.
Bellinger D; Leviton A; Waternaux C; Allred E
Environ Res Oct 1985, 38 (1) p119-29, ISSN 0013-9351 Journal Code: EI2
Contract/Grant No.: 08945; 17407
Languages: ENGLISH
This paper addresses several methodological issues relevant to an

assessment of the association between low-level lead exposure and early development. In particular, we discuss methods for choosing, from a large pool of candidates, the covariates to control when estimating this association. We examine the issue of confounding and explain why adjusting increased, rather than decreased, the estimate of the association between blood lead level and development at 6 months of age in our sample. A step-by-step description of our strategy for model building is presented. Finally, we demonstrate the robustness of the findings by showing that the magnitude and standard error of the estimated lead effect is not affected appreciably by the method of selecting covariates to be controlled for or by the characterization of lead as a continuous, ordinal, or dichotomous variable. Although these issues arose in the course of analyses of data collected by the Boston lead study (D. Bellinger, H. Needleman, A. Leviton, C. Waternaux, M. Rabinowitz, and M. Nichols (1984), Neurobehav. Tox. Teratol., 6, 387-402), they apply to other current prospective lead studies as well.

6/7/27
05748529 86049529
Lead in milk and infant blood: a dose-response model.
Rabinowitz M; Leviton A; Needleman H
Arch Environ Health Sep-Oct 1985, 40 (5) p283-6, ISSN 0003-9896
Journal Code: 6YO
Contract/Grant No.: HD-08945
Languages: ENGLISH
As part of a longitudinal study of the sources and developmental effects of current urban lead exposure, lead was measured in tap water from the homes of 249 infants, in 100 breast milk samples, and in 73 samples of the infant formula used by non-nursing mothers. Also, the blood lead levels of the infants who received these fluids were determined at birth and at 6 months of age. Among the infants who were breast fed, the lead content of their milks correlated very well with their 6-month blood lead levels (r = .42, P = .0003). The mean lead content of infant formulas and breast milk were not significantly different, nor was the blood lead of children fed one or the other. Lead levels in maternal milk correlated poorly with umbilical cord blood lead (r = .18, P = .10). Tap water and infant blood lead levels correlated minimally (r = .11, P = .10). Since milk represents [illegible] of the diet of young infants and because breast milk lead levels are [illegible], it is possible to relate blood lead and daily dosage in this population.

6/7/28
05530412 85146412
Home refinishing, lead paint, and infant blood lead levels.
Rabinowitz M; Leviton A; Bellinger D
Am J Public Health Apr 1985, 75 (4) p403-4, ISSN 0090-0036
Journal Code: 3XW
[illegible]
Languages: ENGLISH
We measured the blood lead levels of 249 infants semi-annually from birth to two years of age; we sampled the home paint and recorded any recent home refinishing activity. Mean blood lead from birth to age 2 years did not vary systematically with age but did correlate significantly with the amount of lead in the indoor paint (p less than .01). Refinishing activity in homes with high lead paint was associated with elevations of blood lead averaging 69 per cent.

6/7/29
05499365 85115365
Lead and IQ scores: a reanalysis [letter]

Needleman HL; Geiger SK; Frank R
Science Feb 15 1985, 227 (4688) p701-2, 704, ISSN 0036-8075
Journal Code: UJ7
Languages: ENGLISH

6/7/30
05470520 85086520
Early sensory-motor development and prenatal exposure to lead.
Bellinger DC; Needleman HL; Leviton A; Waternaux C; Rabinowitz MB; Nichols ML
Neurobehav Toxicol Teratol Sep-Oct 1984, 6 (5) p387-402, ISSN 0275-1380 Journal Code: NXX
Contract/Grant No.: HD 08945
Languages: ENGLISH
As part of a longitudinal study of the early developmental effects of exposure to lead, we administered the Bayley Scales of Infant Development at age 6 months to infants classified into three groups based on their umbilical cord blood lead levels ("low": mean = 1.8 micrograms/dl; "mid": mean = 6.5 micrograms/dl; "high": mean = 14.6 micrograms/dl). No infant had a cord blood lead level greater than 30 micrograms/dl, the level currently regarded as the upper limit of "normal" for young children. Multiple regression analyses indicated that high cord blood levels were associated with lower covariance-adjusted scores on the Mental Development Index. Scores on the Psychomotor Development Index were not significantly related to cord blood lead level. The level of lead in blood at 6 months of age was not associated with scores on either the Mental or Psychomotor Development Index. These data are compatible with the hypothesis that low levels of lead delivered transplacentally are toxic to infants.

6/7/31
05429629 85045629
Lead in umbilical blood, indoor air, tap water, and gasoline in Boston.
Rabinowitz M; Needleman H; Burley M; Finch H; Rees J
Arch Environ Health Jul-Aug 1984, 39 (4) p299-301, ISSN 0003-9896
Journal Code: 6YO
Contract/Grant No.: HD 08945
Languages: ENGLISH
A strong statistical correlation was found among the monthly averages of lead concentrations in umbilical cord blood (about 500 births/month), indoor air (12 sites/month), and gasoline lead sales between March, 1980 and April, 1981 in Boston. Tap water lead (24/month) variations did not correlate with blood lead in this population.

6/7/32
05277982 84201982
Variability of blood lead concentrations during infancy.
Rabinowitz M; Leviton A; Needleman H
Arch Environ Health Mar-Apr 1984, 39 (2) p74-7, ISSN 0003-9896
Journal Code: 6YO
Contract/Grant No.: HD-08945
Languages: ENGLISH
As part of a study of early childhood development, more than 200 children had their blood lead concentrations (PbB) determined semiannually during the first 2 yr of life. These children were selected from 11,837 consecutive births surveyed for umbilical cord PbB at Boston Lying-In Hospital. Candidate subjects were drawn from the highest, lowest, and middle deciles of PbB. The mean PbB was 7.2 +/- 5.3 (standard deviation) micrograms/dl at birth and did not change appreciably with age. However, the average change in an individual's PbB every 6 months was 4 micrograms/dl, which was several fold in excess of the analytical

reproducibility. Only 25% of the children in the highest category at birth were in the highest category at 2 yr of age. Approximately 40% of the children remained in their immediately previous PbB tertile category. A stochastic description of these patterns of change fits the data. Our results should caution investigators who might wish to rely on a single determination to categorize children with PbB.

6/7/33
05264756 84188756
The relationship between prenatal exposure to lead and congenital anomalies.
Needleman HL; Rabinowitz M; Leviton A; Linn S; Schoenbaum S
JAMA Jun 8 1984, 251 (22) p2956-9, ISSN 0098-7484 Journal Code: KFR
Contract/Grant No.: HD 08945
Languages: ENGLISH
We obtained umbilical cord blood from 5,183 consecutive deliveries of at least 20 weeks' gestation and analyzed them for lead concentration. Those demographic and socioeconomic variables, including lead, which were shown on univariate analysis to be associated with increased risk for congenital anomalies were evaluated and controlled by entering them into a stepwise logistic-regression model with malformation as the outcome. Coffee, alcohol, tobacco, and marijuana use, which were associated with lead level, but not risk of malformation, were also controlled. The model was reduced in steps by eliminating the variables with the highest P value, until the most parsimonious model was created. The relative risk for anomalies associated with lead was then calculated while holding other covariates constant. Lead was found to be associated, in a dose-related fashion, with an increased risk for minor anomalies.

6/7/34
05232205 84156205
Evolution to eosinophilic leukemia with a t(5:11) translocation in a patient with idiopathic hypereosinophilic syndrome.
Yoo TJ; Orman SV; Patil SR; Dorminey C; Needleman S; Rajtora D; Graves N; Ackerman L; Taylor WW
Cancer Genet Cytogenet Apr 1984, 11 (4) p389-4, ISSN 0165-4608 Journal Code: CMT
Languages: ENGLISH
The idiopathic hypereosinophilic syndrome (HES) comprises a diverse group of diseases that may ultimately lead to multiorgan dysfunction and death. We present a case of a man who was followed for over 9 years with HES that underwent malignant transformation to acute leukemia with eosinophilic features. The patient's clinical acceleration was accompanied by the development of a malignant clone that was identified with banding techniques as 46,XY,t(5:11)(p15;q13). Electron microscopy reaffirmed findings reported in earlier cases of eosinophilic leukemia. Among his illness were cytotoxic drugs administered. In addition to delineating the natural evolution and cytostructural details of the case, we emphasize the role of cytogenetics in the predicting of malignant variants of the hypereosinophilic syndrome and in identifying eosinophilic leukemia.

6/7/35
05170165 84094165
Lead at low dose and the behavior of children.
Needleman HL
Neurotoxicology Fall 1983, 4 (3) p121-33, ISSN 0161-813X Journal Code: CAP
Languages: ENGLISH

6/7/36
05072649 83305649
Childhood lead poisoning [letter]
Needleman HL
Am J Dis Child Oct 1983, 137 (10) p1025, ISSN 0002-922X
Journal Code: 3GS
Languages: ENGLISH

6/7/37
05019380 83252380
Lead at low dose and the behavior of children.
Needleman HL
Acta Psychiatr Scand Suppl 1983, 303 p26-37, ISSN 0065-1591
Journal Code: 1W3
Languages: ENGLISH
Over 3,000 children attending first and second grade in public school were classified as to past lead exposure according to the concentrations of lead in their teeth. Those in the highest and lowest deciles for lead were evaluated by a broad panel of neuropsychologic outcome measures. Controlled either by matching or analysis of covariance were 39 other variables which ıld effect outcome. High lead children were significantly impaired on IQ ditory processing and reaction time under varying intervals of delay. eacher's rating scales showed a dose-related increase in non-adaptive classroom behavior with no evidence of a threshold. EEG scores and observations of children in class demonstrated differences in high and low lead subjects.

6/7/38
04959706 83192706
The neurobehavioral consequences of low lead exposure in childhood.
Needleman HL
Neurobehav Toxicol Teratol Nov-Dec 1982, 4 (6) p729-32, ISSN 0275-1380 Journal Code: NXX
Languages: ENGLISH
Children attending non-remedial first and second grades were classified according to the concentration of lead in their shed deciduous teeth. Children in the lowest and highest tenth percentile were studied with a tailed neuropsychological battery under blind conditions. Thirty-nine on-lead covariates were controlled either by matching or in the biostatistical analysis. High lead children tended to have significantly lower IQ scores particularly on the verbal scales of the WISC-R, impaired auditory and language processing, increased reaction times at longer intervals of delay. Their teachers who were blind to the dentine lead levels found an increased incidence of disordered classroom behavior in direct relationship to the concentration of lead in their teeth. Quantitative electroencephalographic analysis demonstrated decreased midline alpha and increased midline delta in high lead subjects. Four years later a subsample of these children was followed up and observed during quiet classroom activity. High lead children tended to spend more time off tasks staring at classmates, out the window or at the observer. These observations demonstrate that lead at doses below those which are associated with frank clinical symptoms produce deficits in intelligence, attention, auditory-language function and disordered classroom behavior.

6/7/39
04930551 83163551
Lead and the relationship between maternal and child intelligence.
Bellinger DC; Needleman HL
J Pediatr Apr 1983, 102 (4) p523-7, ISSN 0022-3476 Journal Code: JLZ

Contract/Grant No.: HD-08945
Languages: ENGLISH
Using regression analysis, we show that the IQs of children with elevated levels of dentine lead (greater than 20 parts per million) are below those expected, based on their mothers' IQs. Moreover, the amount by which a child's IQ falls short of the expected value increases with increasing levels of dentine lead in what may be a nonlinear fashion. Although lead level contributed nothing to the prediction of IQ for children with low levels of dentine lead (less than 10 parts per million), it rivaled maternal IQ in importance as a predictor in the group with elevated lead values. Thus for schoolchildren with lead burdens in the highest decile of the distribution for the urban area we sampled, the usual relationship between maternal and child IQ appears to be disrupted in a manner systematically related to lead levels in dentine.

6/7/40
04854475 83087475
Petrol lead sales and umbilical cord blood lead levels in Boston, Massachusetts [letter]
Rabinowitz M; Needleman HL
Lancet Jan 1 1983, 1 (8314-5) p63, ISSN 0023-7507 Journal Code: L0S
Languages: ENGLISH

6/7/41
04841936 83074936
The health effects of low level exposure to lead.
Needleman HL; Landrigan PJ
Annu Rev Public Health 1981, 2 p277-98, ISSN 0163-7525
Journal Code: ABA
Languages: ENGLISH

6/7/42
04806765 83039765
The neuropsychiatric implications of low level exposure to lead.
Needleman HL
Psychol Med Aug 1982, 12 (3) p461-3, ISSN 0033-2917 Journal Code: OER
Languages: ENGLISH

levels of more than 15 micrograms/dL. Biochemical and functional changes have been demonstrated in the heme biosynthetic pathway and in the renal, cardiovascular, endocrine, immune, and nervous systems. The threshold for effect depends on the sensitivity of the methods used. A no-effect level has not been found. Further, this is not a disease of the poor alone. But the poor are exposed to much more lead than are the more economically favored. Deficiencies in body calcium, zinc, iron, and protein stores are associated with increased uptake. Optimizing nutrition enhances the resistance to lead. All children should be screened for lead at regular intervals, especially those with anemia, growth failure, and developmental or behavioral problems. Treatment protocols are well worked out, but chelation is only part of the therapy. Controlling the environment, strengthening the family's supports, enhancing nutrition, and offering remedial education are essential to a successful therapeutic outcome. Lead control has involved a continuing struggle between vested economic interests and regulatory agencies. In one area, the control of airbone lead, science, and public health have prevailed. In the past decade, the amount of alkyl lead consumed in gasoline additives has been reduced by 99%. Body lead burdens have dropped in close correspondence.(ABSTRACT TRUNCATED AT 400 WORDS) (110 Refs.)